

Lung Cancer by Occupation in the U.S. Trucking Industry

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Air Resources Board
California Environmental Protection Agency

Thank you Mr. Goldstene and good afternoon Chairman Nichols and members of the Board. In today's health update, I will present the latest findings on the lung cancer mortality impacts by job categories in the U.S. trucking industry. This study is part of a much larger ongoing nationwide assessment of the health impacts on workers in the trucking industry who are routinely exposed to motor vehicle exhaust, including diesel particulate matter.

Background

- Diesel exhaust particles identified as a toxic air contaminant with the potential to cause cancer
- Diesel PM contributes to outdoor PM_{2.5} levels
 - Associated with heart disease, lung cancer & premature death
- Previous results¹ showed increased risk for:
 - Heart disease and lung cancer deaths for drivers and dockworkers vs. general population



¹Laden, F., et al. 'Cause-Specific Mortality in the Unionized U.S. Trucking Industry', Environmental Health Perspectives 115:1192-1196 (2007). Funded by a grant from the National Institutes of Health/National Cancer Institute.

First, I will briefly go over some background information on diesel particulate matter (PM). California identified diesel exhaust PM as a toxic air contaminant in 1998 based on its potential to cause cancer. As you know, trucks are major contributors to diesel PM and diesel PM is a contributor to outdoor PM_{2.5} levels in California. A growing body of literature exists which links outdoor PM_{2.5} exposure to adverse health effects, such as heart disease, lung cancer and even premature death. Additionally, recent studies have begun to investigate further the effects associated with occupational exposure to diesel engine exhaust, which is a concern because employees working in and around trucks may be particularly at risk due to their continued exposure. Earlier this year we reported on a study by Laden and colleagues who found an increased risk for lung cancer and heart disease deaths for drivers and dockworkers in the trucking industry as compared to the general U.S. population of the same age group.

U.S. Trucking Industry Study

- National study of 31,000 Teamsters Union members
- Work records & cause of death, 1985-2000
- Job-specific exposures: clerks, mechanics, long-haul, pick up & delivery (P&D), dockworkers, and combination (dockworkers and P&D)
- Examined lung cancer mortality and employment duration in each job category
- Accounted for “healthy worker” effect

Garshick, E., et al. 'Lung Cancer and Vehicle Exhaust in Trucking Industry Workers' Environmental Health Perspectives 116:1327-1332 (2008).
Funded by grants from the National Institutes of Health/National Cancer Institute and from the National Institute of Environmental Health Sciences.



The results that I am presenting today are from a national study led by Dr. Garshick, which involves the participation of about 31,000 members of the Teamsters Union from four companies. The analysis was limited to men older than 39 years of age in 1985 with at least one year in the trucking industry. The investigators obtained detailed work records and cause of death of Teamsters employed from 1985 to the year 2000. Each job category in this population has distinct exposure patterns. For example, long-haul and pickup and delivery drivers are exposed directly to traffic; while dockworkers are exposed to trucks in the yard and exhaust from forklifts. To provide insight into lung cancer death patterns associated with these exposures, the investigators examined lung cancer death rates by the different job categories in the trucking industry compared to all the remaining workers within the same age group. The investigators accounted for the healthy worker effect, which is that people who are able to stay in their job, tend to be healthier than those who leave employment. On average people in the Teamster union worked for 22 years, 73% worked between 20 to 40 years in this industry.

Results

- 4,306 total deaths and 779 lung cancer deaths
- Higher risk of lung cancer for:
(by job category vs all workers)
 - More years worked
 - Long haul, dockworkers, P&D, combination (dockworkers and P&D): 65% to 120% for 20 yrs worked
- Limitations
 - No information on previous work history, personal risk factors or exposure



During the time of the study, there were 4,306 deaths recorded with 779 lung cancer deaths. After adjusting for age and healthy-worker survivor effects, the study found that lung cancer mortality risks were elevated in workers with jobs associated with regular exposure to diesel and other vehicle exhaust and that risk increased with more years on the job. The calculated increased risk associated with an estimated 20 years of work for each specific job vs. all workers ranged from 65% to 120% for long haul, dockworkers, P&D, and combination workers. Combination workers are those that worked both jobs as dockworkers and pick up and delivery. Despite the limitations of the study, shown on this slide, the results showed a trend in lung cancer mortality risk that was positively associated with years of work in jobs with regular exposure to freshly emitted diesel vehicle exhaust.

Comparison to Other Lung Cancer Risks

- Trucking industry lung cancer rates one of the five highest of all surveyed¹
- Railroad workers also showed increased risk of lung cancer²
- Lung cancer risk from environmental tobacco smoke exposure³ similar to most exposed workers in the trucking industry



¹ Proportional mortality rate for white males, 15-64 years old, 1984-1998, Centers for Disease Control and Prevention, National Institute of Occupational Health, National Occupational Mortality Surveillance:
<http://www.cdc.gov/niosh/occupational/surveillance/NOMS/default.html>.

² Garshick, E., et al. 'Lung Cancer in Railroad Workers Exposed to Diesel Exhaust' Environmental Health Perspectives 112: 539-1543 (2004). Supported by grants from NIOSH and the National Cancer Institute.

³ The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General (2006) Office of the Surgeon General, U.S. Department of Health and Human Services

To give you an idea how this increase in lung cancer risk in the trucking industry compares to other industries, we looked at the National Occupational Mortality Surveillance System, a national database from the Centers for Disease Control and saw that, for white males between 15 to 64 years of age from 1984 to 1998, the trucking industry had lung cancer rates that were among the five highest of all surveyed industries. Moreover, the reanalysis of Dr. Garshick's previous studies of railroad workers supports the conclusion that working in an industry with elevated exposure to vehicle exhaust and diesel PM increases risk of lung cancer.

Probably one of the most well known risk factors for lung cancer is regular exposure to second-hand tobacco smoke. How does this environmental tobacco smoke risk compare to the risk to industry workers who have had regular exposure to vehicle exhaust from diesel and other vehicles? The Surgeon General's 2006 report found a similar lung cancer risk for nonsmokers who live with a smoker compared to that reported in the literature at large for industry workers exposed to vehicle exhaust and diesel PM.

Conclusions & Implications

- Workers in the trucking industry exposed to vehicle exhaust have an elevated risk of lung cancer with increasing years of work
- Reduction of diesel PM expected to have health benefits for workers in the trucking industry
- Diesel PM control measures will also reduce exposure and risk of adverse health impacts for all Californians



The results of this study are important. They show that workers in the trucking industry who are exposed to diesel and other vehicle exhaust have an increased risk for lung cancer and that the risk of dying from lung cancer is likely to increase with increasing time on the job.

The results from this study are consistent with previous studies in the United States and Canada that show an increased risk of lung cancer in occupations which are likely to be associated with exposure to diesel vehicle exhaust. These results imply that reduction of diesel PM emissions will have health benefits associated with job-specific exposures to diesel and other vehicle exhaust in the trucking industry.

In addition, the health impacts from diesel PM emissions are of concern to all Californians. We are all exposed to diesel particles. Diesel PM control measures implemented by the ARB, including the one that will be heard today which reduce exposures on roadways and from idling trucks, will help reduce the risk of adverse health impacts from diesel PM exposure not only in the trucking industry, but also in the general population that lives, commutes, or works in proximity to diesel-exhaust sources.

This concludes my presentation, and I will be happy to answer any questions.